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CURRENT LITERATURE.

BOOK REVIEWS.

Physiological plant anatomy.

THAT physiological anatomy is not one of those subjects that may be regarded as completed, so far as important new researches are concerned, is illustrated when one makes a comparison of the second and third editions of HABERLANDT'S well-known work.[1] The first edition of this important work appeared in 1884, and since then there has been no excuse for the presentation of anatomy in a dead and formal manner. A second edition was issued in 1896,[2] and now in a still shorter time we are favored with a third edition. In this the pages have been increased from 550 to 616, and the figures from 235 to 264. While the general plan of the work resembles that of the second edition, there are many noteworthy additions in most of the chapters, and the latter part of the book has been rewritten, because the knowledge of these topics has been almost revolutionized, and in large part through the discoveries of the author himself.

The introductory chapters on plant cells and tissues, and embryonic tissues have suffered little change; a new section is added, dealing with the size of cells. In the chapter entitled "Das Hautsystem," there is a new subsection on secondary epidermal functions. Anthocyan receives a fuller treatment, while the recent studies of DAMM on perennial epidermis, and TITTMANN on the regeneration of wax rods are summarized. Little change in the treatment of the mechanical tissues is to be seen, except for the introduction of the experimental work of VÖCHTING, BALL, and WIEDERSHEIM. More is added regarding the absorption tissues. There is a new paragraph dealing with absorption in insectivorous plants, and SCHAAR'S discovery of a cambium layer in the thallus of Rafflesia is fully described. The author clings to his former views regarding the functions of rhizoids and aerial roots, and fails to accept as conclusive the work of KAMERLING, PAUL, and NABOKICH. It is disappointing to see no essential change in the treatment of mycorhiza, a topic concerning which vastly more is known than in 1896. In the chapter entitled "Das Assimilationssystem," NORDHAUSEN'S work on palisade cells is considered, but the excellent work of GRIFFON and others receives little or no mention. Latex tubes are still regarded as conductive vessels; ROTHERT'S studies on the structure of the fibrous thickenings of conductive vessels give material for an interesting additional statement. The most notable additions to the chapter on storage tissues are a description of Jönsson's peculiar "mucilage cork," water storage cells derived from phellogen; and a note regarding Fischer's work on inulin. Much new material is found in the chapter on aeration tissues: Raciborski's breathing organs in early leaf stages; Westermaier's remarkable but questionable lung-like organ on Sonneratia roots; Brown and Escombe's brilliant work on gas diffusion; Kamerling on liverwort pores; Porsch on adaptations for securing permanent closure in the stomata of submerged hydrophytes; and Devaux on lenticels. Haberlandt disagrees in part with Devaux's results, and does not consider the paper as very important; he also rejects Wieler's results concerning aerenchyma. There is an excellent new figure of a lenticel, and another interesting new figure is that of the stoma of Nipa. Another chapter that is rich in new matter is that on "Die Sekretionsorgane und Exkretbehälter." The hydathode figure is much improved, and the rich recent literature on hydathodes is well summarized; little or no credit is given to the views of Spanjer and Lepeschkin, insofar as they are contrary to the views formerly expressed by the author. One of the notable additions here is the discovery of glands in Ruta which discharge to the exterior by means of slits that arise between external cells.

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[1] HABERLANDT, G., Physiologische Pflanzenanatomie. Dritte, neubearbeitete und vermehrte Auflage. Imp. 8vo. pp. xvi+616. *fig. 264.* Leipzig: Wilhelm Engelmann. 1904.

[2] See review in BOT. GAZ. **23**:472. 1897.

Far the most notable change of the new edition is to be found in the expansion of the old eleventh chapter, entitled "Apparate und Gewebe für besondere Leistungen." The material there presented is now considered in three chapters, entitled respectively "Das Bewegungssystem," "Die Sinnesorgane," "Einrichtungen für die Reizleitung." In the chapter on motor tissues there is a fuller discussion of the hygroscopic tissues. There is an entirely new section on cohesion mechanisms, embracing the contributions of Kamerling, Steinbrinck, and Schrodt, regarding the movements that are due to the cohesive force of water in the cell lumina of fern sporangia and liverwort elaters. Much is also added in the section dealing with living motor tissues, embracing in particular the contributions of Fitting, Schwendener, Möbius, Pantanelli, and Haberlandt. The topic which has been most completely recast is that of the sense organs, and in this field Haberlandt himself has been a pioneer and major contributor. This chapter for the most part may be regarded as a summary of the volume on this subject which has but recently come from the author's hand. After an introduction treating the general characteristics of sense organs in plants, there is a specific description of the tactile pits of Cucurbita and Drosera, the tactile papillae of various stamen filaments, and the tactile hairs of Centaurea, Biophytum, Mimosa, Aldrovandia, and Dionaea. Then follows an account of the sense organs for the perception of gravity and light stimuli; here there is a description of the statolith organs of plants, in which there is incorporated the chief results of Němec, Noll, Jost, Darwin, and particularly those of the author. In the chapter on motor mechanisms, there is an entirely new section dealing with the intercellular and intracellular fibrillar structures, to which Němec in particular has devoted so much attention. Haberlandt still holds to his former view concerning the motor mechanisms of Mimosa, in spite of the doubt cast upon his theory by the work of MACDOUGAL and FITTING.

The noteworthy changes that are to be found in this third edition make it necessary for all libraries. Many among us may not accept the teleological views that are to be found throughout the work, and it may occasion disappointment to find at several points, as stated above, that the author maintains his own unstable theories in the face of what will appeal to most botanists as conclusive proof against them. In particular, it is highly doubtful if we may longer believe in the condensing power of the aerial roots of orchids, conduction by the shortest route as explaining the elongation of palisade cells, the conductive function of latex tubes, the secretive rather than storage function of aleurone, or the hydrostatic propagation of stimuli in Mimosa.

The teleological views of the author are apparently not merely conveniences of expression, but purpose in plant structures appears to be regarded as an objective reality, which operates as a cause in the development of plant organs and tissues. As a consequence, it may not be surprising that the author is almost violent in his opposition to the contributions of such men as DEVAUX, SPANJER, and WIELER, and gives no place at all or at most inadequate consideration to the work of such men as GRIFFON, BERNARD, and FRIEDEL. The trend of modern investigation is certainly away from the idea that purpose is the directive factor in the evolution of structures, as well as from the idea that all structures must have a definite and advantageous function. However, the vast majority of structures are certainly useful, and the study of function in relation to structure gives life and vitality to what is otherwise a dead and profitless study to most students. And for this reason HABERLANDT'S work fills a place that is taken by no other work. For this reason, too, it is much to be hoped that there will soon be available a translation of this third edition.—H. C. COWLES.

Smoke and vegetation.

THERE have been a number of treatises dealing with the injurious effects of smoke on vegetation, but we are now favored with a monographic treatment of the subject by HASELHOFF and LINDAU.[3] There are first some general considerations on the origin of smoke, the characteristics and extent of its injuries to plants, the various causes of the formation of leaf spot, and the comparison of normal plant characteristics with injuries due to smoke. The body of the work deals with the injurious smokes and vapors in detail. Particular attention is paid to the effect of sulfurous and sulfuric acid vapors. Injurious effects are found to be associated chiefly with the foliage organs; little or no harm comes to the plant through vapors which may have been absorbed by the soil. Harmful effects are made evident through the formation of leaf spots, the death of leaves and young branches, the disorganization of chloroplasts, plasmolysis,

[3] HASELHOFF, E., and LINDAU, G., Die Beschädigung der Vegetation durch Rauch: Handbuch zur Erkennung und Beurteilung von Rauchschäden. Imp. 8vo. pp. viii+412. *figs. 27.* Berlin: Gebrüder Borntraeger. 1903. *M*10.